KHDaUdcm method of decimal point jumping
a worksheet of METRIC CONVERSIONS involving a change of prefix only

0.57 grams = 570 milligrams

K H Da U d c m

8.9 KL = 890 daL

K H Da U d c m

6351 cm = 0.6351 hectometers

4.5 x 10^{-3} dekaLiters = 45 milliLiters

2.40 x 10^{2} milliLoGoMs = 2.40×10^{-4} kilo LoGoMs

NAME:

(1).....FACTOR LABEL METHOD of Solving Conversion Problems

1. How many kilometers are there in 3.20×10^{2} meters? $1000\ m = 1\ km$

$$3.20\times10^{2}\ \cancel{m}\left(\frac{1\ km}{1000\ \cancel{m}}\right) = 3.20\times10^{-1}\ km \text{ or } 0.320\ km$$

2. How many milliliters are there in 0. 500 Liters? $1000\ mL = 1\ L$

$$0.500\ \cancel{L}\left(\frac{1000\ mL}{1\ \cancel{L}}\right) = 500\ mL \text{ or } 5.00\times10^{2}\ mL$$

3. How many seconds are there in 40 000 minutes? $1\ min = 60\ s$

$$40{,}000\ \cancel{min}\left(\frac{60\ s}{1\ \cancel{min}}\right) = 2{,}400{,}000\ s \rightarrow 2{,}000{,}000\ s \text{ or } 2\times10^{6}\ s$$

4. How many milligrams are there in 7.02×10^{-2} kilograms? (Do this in two steps with two conversion factors.) $1000\ g = 1\ Kg$. $1000\ mg = 1\ g$

$$7.02\times10^{-2}\ \cancel{Kg}\left(\frac{1000\ \cancel{g}}{1\ \cancel{kg}}\right)\left(\frac{1000\ mg}{1000\ \cancel{g}}\right) = 7.02\times10^{4}\ mg$$

5. How many milliseconds are there in 15 decades? (6 conversion factors)

$1\ decade = 10\ yrs$ $1\ year = 365\ days$ $1\ day = 24\ hr$ $1\ hr = 60\ min$ $1\ min = 60\ s$. $1000\ ms = 1\ s$

$$15\ \cancel{decades}\left(\frac{10\ \cancel{yr}}{1\ \cancel{decade}}\right)\left(\frac{365\ \cancel{day}}{1\ \cancel{yr}}\right)\left(\frac{24\ \cancel{hr}}{1\ \cancel{day}}\right)\left(\frac{60\ \cancel{min}}{1\ \cancel{hr}}\right)\left(\frac{60\ \cancel{sec}}{1\ \cancel{min}}\right)\left(\frac{1000\ ms}{1\ \cancel{s}}\right) = 4.7304\times10^{12} \rightarrow 4.7\times10^{12}\ ms$$

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NAME:

(2).....Practice problems using dimensional analysis (Factor Label Method) in multiple steps

1. How many liters does a 13-gallon tank hold? (1.1 qt = 1 L) SIG FIGS!!!!!!!!!!!

$1\,gal = 4\,qt$

$$13\,gal\left(\frac{4\,qt}{1\,gal}\right)\left(\frac{1\,L}{1.1\,qt}\right) = 47.27272727\,L \rightarrow 47\,L$$

2. If the average chemistry student is 5.5 feet tall, what is this height in centimeters? (1.00 in = 2.54 cm) $12\,in = 1\,ft$

$$5.5\,ft\left(\frac{12\,in}{1\,ft}\right)\left(\frac{2.54\,cm}{1\,in}\right) = 167.64\,cm \rightarrow 170\,cm$$

3. You decide to buy 17 pounds of Ooey Gooey Yummy Gummy candy for your next party. The "Ye Olde Metric Confectionery Shoppe" wants to know how many grams you want to order. (2.2 lbs. = 1.0 kg) $1000\,g = 1\,kg$

$$17\,lbs\left(\frac{1.0\,kg}{2.2\,lb}\right)\left(\frac{1000\,g}{1\,kg}\right) = 454.5454545\,g. \rightarrow 77227\,g$$

$77,000\,g$

4. In order to earn $42 000 per year, how much per hour must your salary be? Assume that you work 50 weeks per year, 5 days per week, 8 hours per day.

$$\frac{\$42{,}000}{1\,yr}\left(\frac{1\,yr}{50\,wk}\right)\left(\frac{1\,wk}{5\,day}\right)\left(\frac{1\,day}{8\,hr}\right)=\$21/hr$$

5. An exchange student lands on Mars and finds a chemical supply house. She needs 140 grams of dilithium crystals to continue her experiments. The Martian supplier asks her , "How many zoops of dilithium do you need?" She thinks, "O no, my chemistry teacher was right! I have to do a units conversion." She refers to her superelectronic memory enhancer and finds out the following: 9 poofs (pf)= 1 gram (g); 2 fings (fn) = 7 warps (wp);
8 poofs = 3 warps ; 4 zoops (zp) = 3 fings
How many zoops did she finally request?

$$140\,g\left(\frac{9\,pf}{1\,g}\right)\left(\frac{3\,wp}{8\,pf}\right)\left(\frac{2\,fn}{7\,wp}\right)\left(\frac{4\,zp}{3\,fn}\right)=168\rightarrow 170\,zp$$

6. A car going 15 miles per hour is traveling how many meters per second? (1km = 0.621mi)

1000m = 1 Km 1 hr = 60 min 1 min = 60 s

$$\frac{15\,mi}{1\,hr}\left(\frac{1\,km}{0.621\,mi}\right)\left(\frac{1000\,m}{1\,km}\right)\left(\frac{1\,hr}{60\,min}\right)\left(\frac{1\,min}{60\,s}\right)=6.709608158\,m/s$$

$\rightarrow 6.7\,m/s$

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(3).....MORE PROBLEM SOLVING using FACTOR LABEL METHOD

1. If your heart pumps blood at a rate of 6.8 fluid ounces (fl. oz.) per second, then what is this rate in gallons per hour? (32 fl. oz. = 1 qt) (190 gal/h)

$1\,gal = 4\,qt$ $60\,min = 1\,hr$ $1\,min = 60\,s$

$$\frac{6.8\,fl.oz}{1\,s}\left(\frac{1\,qt}{32\,fl.oz}\right)\left(\frac{1\,gal}{4\,qt}\right)\left(\frac{60\,s}{1\,min}\right)\left(\frac{60\,min}{1\,hr}\right) = 191.25\,gal/hr$$

$\rightarrow 190\,gal/hr$

2. The fastest recorded hard baseball pitch is allegedly 108 mph. What is this in m/s? (5280 ft = 1 mile; 12 in = 1 ft; 2.54 cm = 1 in; 100 cm = 1 m; 3600 s = 1 h) (48.3 m/s)

$$\frac{108\,mi}{1\,hr}\left(\frac{5280\,ft}{1\,mi}\right)\left(\frac{12\,in}{1\,ft}\right)\left(\frac{2.54\,cm}{1\,in}\right)\left(\frac{1\,m}{100\,cm}\right)\left(\frac{1\,hr}{60\,min}\right)\left(\frac{1\,min}{60\,s}\right) = 48.3\,m/s$$

3. A cube of gold is 4.02 cm on each side. What is its mass in grams? (1250 g)
(density = 19.3 g/ml)

$D = \frac{m}{V}$ $\quad m = D \times V$

$$\frac{19.3\,g}{mL}\left(\frac{1\,mL}{1\,cm^3}\right)\left(\frac{4.02\,cm}{1}\right)^3 = 1253.820794\,g = 1250\,g$$

4. A troy ounce of gold is selling for $367.13 . How much is the cost of a cube of gold 2.00 cm on each side? (1.00 troy ounce, tr. oz. = 31.1 grams) ($1820)

$D = \frac{m}{V}$ $m = D \times V$

measured value

$$\frac{19.3\,g}{1\,mL}\left(\frac{1\,mL}{1\,cm^3}\right)\left(\frac{2.00\,cm}{1}\right)^3\left(\frac{1\,tr.oz}{31.1\,g}\right)\left(\frac{\$367.13}{1\,tr.oz.}\right) = 1822.664695$$

→ $ 1820

5. A patient is to receive a certain medication at a dosage of 1.20 mg of drug/ kg of body mass. How many grams of medication does a 183 lb patient get? (0.0998 g drug)

$$183\,lb\left(\frac{1\,kg}{2.2\,lb}\right)\left(\frac{1.20\,mg}{1\,kg}\right)\left(\frac{1\,g}{1000\,mg}\right) = 0.099818182$$

→ 0.0998g

NAME: _____ pd

(4).....Worksheet of challenging problems.....SHOW ELEGANT WORK!!!!!!!!

1. When 121 g of sulfuric acid are added to 4.00 x 10^2 mL of water (at 4°C), the resulting solution's volume is 437 mL. What is the density of the resulting solution?

$D = \frac{m}{V}$

$\frac{1g}{1mL}\left(\quad\right)$

$$\frac{4.00 \times 10^2 \text{ mL}\left(\frac{1g}{1mL}\right) + 121g}{437 \text{ mL}} = 1.19221968 \rightarrow 1.19 \text{ g/mL}$$

2. The density of dry air at 20° C is 1.20 g/L. What is the mass of air, in kilograms, in a rectangular room that measures 25.0 m by 15.0 m by 4.0 m ?

$D = \frac{m}{V}$ $\quad m = DV$

measured values least # of sig fig (2)

$$\frac{1.20g}{L}\left(\frac{1L}{1000mL}\right)\left(\frac{1mL}{1cm^3}\right)\left(\frac{100cm}{1m}\right)^3\left(\frac{25.0m \times 15.0m \times 4.0m}{1}\right)\left(\frac{1Kg}{1000g}\right) =$$

1800 Kg

3. Indiana Jones, at the beginning of Raiders of the Lost Ark, finds an ancient solid gold idol in a South American jungle cave. The idol appears to have a volume of 1.5 Liters. What weight of sand in pounds would Indiana Jones need in order to replace the idol on its booby-trapped pedestal? What volume in Liters is this sand? (The density of sand is 1.6 kg/L.)

Density of Gold = $19.3 \frac{g}{mL}$ $D = \frac{m}{V}$ $m = DV$

Mass of sand needed

$$1.5\,\cancel{L}\left(\frac{1000\,\cancel{mL}}{1\,\cancel{L}}\right)\left(\frac{19.3\,\cancel{g}}{1\,\cancel{mL}}\right)\left(\frac{1\,\cancel{kg}}{1000\,\cancel{g}}\right)\left(\frac{2.2\,lb}{1\,\cancel{kg}}\right) = 63.69 \longrightarrow 64\,lb$$

Volume of sand

$$63.69\,\cancel{lb}\left(\frac{1\,\cancel{kg}}{2.2\,\cancel{lb}}\right)\left(\frac{1\,L}{1.6\,\cancel{kg}}\right) = 18.09375 \longrightarrow 18\,L$$

↑ mass was calculated, not measured. Need to go back to original volume of idol.

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